

Scientific exploration of Jovian System by JUICE Mission: Participation of Japanese team

SASAKI, Sho^{1*} ; SAITO, Yoshifumi² ; JAPAN, Juice²

¹Dept. Earth and Space Science, Osaka University, ²ISAS/JAXA

The largest planet in the solar system, Jupiter, is a rapidly rotating hydrogen-helium gaseous body with strong magnetic field and associated magnetosphere. Recent discoveries of exoplanets suggest that Jupiter should represent a body not only in the solar system but also in the universe. Jupiter has various satellites: four large satellites, Io, Europa, Ganymede, and Callisto, were discovered by Galileo 400 years ago. Three of them except Io are icy moons.

The Jupiter system was observed by several flyby missions such as Pioneer 10 and 11, Voyager 1 and 2, Cassini, New Horizons and investigated by Galileo orbiter and its atmospheric entry probe. Galileo spacecraft data was very limited without capability of its high-gain antenna. So far we knew about Jovian system much less than the Saturnian System, where Cassini spacecraft has been continuously observing. JUNO mission will start observation of Jupiter in 2016. But since the main target of JUNO taking polar orbits is structure and composition of Jupiter, observation of satellites would be limited.

JUICE (Jupiter Icy Moon Explorer) is the ESA first Large-class mission of Cosmic Vision 2015-2025 program. The emergence of habitable worlds around gas giants, and the focus is to characterise the conditions of habitable environments among the Jovian icy satellites, with special emphasis on the Ganymede, Europa, and Callisto. JUICE will be launched in 2022, and will arrive at Jupiter in 2030. After several fly-bys to Europa and Callisto, JUICE will be inserted into an orbit around Ganymede in 2032 and will continue scientific observations for eight months until the end of nominal mission in 2033.

The discussion for the international collaboration for Jupiter mission between ESA and Japan (JAXA) started in 2006. Initially JAXA proposed a magnetospheric orbiter whereas ESA and NASA proposed Ganymede and Europa orbiters, respectively. After the selection of JUICE by ESA in May 2012, six Japanese groups were invited to participate in the mission as Co-Is with instrument development for model payloads. Finally through the selection process of instrument development teams, four of Japanese team partners were selected for the official JUICE instruments. These are GALA (Laser altimeter), SWI (Sub-millimeter wave instrument), PEP (Particle environment package), and RPWI (Radio & Plasma Wave Investigation). Moreover three Japanese scientists are invited to participate in the initial scientific analysis as Co-Is of JANUS (Optical cameras) and J-MAG (Magnetometer). And it is proposed that a longer Mast (for J-MAG) could be supplied from Japan.

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